JEPAS(PG)-2021 **1101500001**

Subject: Fellowship in Regenerative Medicine & Translational Sciences (FRMTS)

Duration: 90 minutes **Full Marks: 100**

Instructions

1. All questions are of objective type having four answer options for each. Only one option is correct. Correct answer will carry full marks 1. In case of incorrect answer or any combination of more than one answer, ¼ mark will be deducted.
2. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, or D.
3. Use only **Black/Blue ball point pen** to mark the answer by complete filling up of the respective bubbles.
4. Mark answers only in the space provided. Do not make any stray mark on the OMR.
5. Write question booklet number and your roll number carefully in the specified locations of the **OMR**. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination centre and put your full signature in appropriate boxes in the OMR.
7. The OMR is liable to become invalid if there is any mistake in filling the correct bubbles for question booklet number/roll number or if there is any discrepancy in the name/ signature of the candidate, name of the examination centre. The OMR may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
8. Candidates are not allowed to carry any written or printed material, calculator, log-table, wristwatch, any communication device like mobile phones etc. inside the examination hall. Any candidate found with such items will be **reported against** and his/her candidature will be summarily cancelled.
9. Rough work must be done on the question paper itself. Additional blank pages are given in the question paper for rough work.
10. Hand over the OMR to the invigilator before leaving the Examination Hall.

FIRMTS MCQ 2021

1. Label the correct oligodendrocyte marker.
   a) NeuN.
   b) SOX10.
   c) Pdx1.
   d) SSEA-1.

2. How stem cells can be delivered into the spinal canal?
   a) Intravenous.
   b) Intra arterial.
   c) Intrathecal.
   d) Intramuscular.

3. What does the forward scatter detect in a flow cytometry of stem cells?
   a) Size of the stem cell.
   b) The complexity or granularity of a stem cell.
   c) Both the complexity or granularity and size of the stem cell.
   d) Helps in identification of the number of viable stem cells present.

4. Where are cytotoxic T cells (CD8+) produced?
   a) Bone marrow.
   b) Lymph nodes.
   c) Thymus.
   d) Spleen.

5. What does cell mediated immunity involves?
   a) Involves plasma cells and antibodies.
   b) Involves granulocytes predominantly.
   c) Involves NK cells, macrophages, CD4 T helper and CD8 Cytotoxic T cells.
   d) Involves B cells.

6. The adipose tissue from sub cutaneous fat is rich in which type of stem cells?
   a) Hematopoietic stem cells.
   b) Embryonic stem cells.
   c) Mesenchymal stem cells.
   d) Induced pluripotent stem cells.

7. What is the difference between chemokines and cytokines?
   a) Cytokine is a general term used for all signalling molecules while chemokines are specific cytokines that functions by attracting cells to sites of infection/inflammation.
   b) Cytokine is a term used for migrating cells while chemokines are specific cytokines that functions as growth factors for cells.
   c) Cytokine is a term used for cells secreting growth factors only while chemokines are specific cytokines that functions as migratory factors for cells.
   d) Cytokine is a term used for migrating cells while chemokines code for both anti and pro inflammatory interleukins.

8. What type of tissue is blood?
    a) Connective tissue.
    b) Hematopoietic tissue.
    c) Adipose tissue.
    d) Endothelial tissue.

9. What does Collagen II synthesize?
    a) Main component of the organic part of bone.
    b) Main collagenous component of cartilage.
    c) Main component of reticular fibers.
    d) Adipocytes will be synthesized.

10. What is hypoxemia?
    a) Low oxygen in your tissues.
    b) Low partial oxygen in your blood.
    c) Low oxygen in your organ.
    d) Low oxygen in your cells.

11. Which is the most abundant protein in our body?
    a) Fibronectin.
    b) Collagen.
    c) Laminin.
    d) Elastin.

12. What are adipocytes?
    a) Cartilgenous tissues.
    b) Fat tissues.
    c) Bone forming tissues.
    d) Fibroblastic tissues.

13. The development and formation of bone is also defined as?
    a) Chondrogenesis.
    b) Adipogenesis.
    c) Osteogenesis.
    d) Calcification.

14. What is inflammation?
    a) Body’s immune system's response to an irritant.
    b) Body’s immune system's response to cancer.
    c) Body’s immune system's response to apoptosis.
    d) Body’s immune system's response to necrosis.

15. Who is regarded as the father of genetics?
    a) Charles Darwin.
    b) Jean Baptiste Lamarck.
    c) Francis Crick.
    d) Gregor Mendel.

16. What is crossing over in genetics?
    a) The swapping of non genetic material that occurs in the germ line.
    b) The swapping of genetic material that occurs in the germ line.
    c) The swapping of genetic material that occurs in the somatic line.
    d) The swapping of genetic material that occurs during mutation.

17. How would you identify the potency of hematopoeitic stem cells?
    a) Formation of teratomas.
    b) Formation of colony forming units.
    c) Formation of adipocytes.
    d) Formation of osteocytes.

18. What is hypoxia?
    a) Low oxygen in blood.
    b) Low oxygen in tissues.
    c) High oxygen concentration in blood.
    d) High oxygen conetration in the tissues.

19. Mesenchymal stem cells are-
    a) Totipotent stem cells.
    b) Unipotent stem cells.
    c) Pluripotent stem cells.
    d) Multipotent stem cells.

20. What is the role of fibrinogen in blood plasma?
    a) Helps in maintaining oncotic pressure.
    b) It is the coagulation protein.
    c) It helps in transferring salts, lipids and hormones.
    d) It helps in production of the immunoglobulins.

21. What is a primary stem cell culture?
    a) Second generation stem cells obtained from the parent generation.
    b) Stem cells directly isolated from humans and animals.
    c) Stem cells that are transformed or genetically engineered.
    d) Stem cells that have mutated from their original cells.

22. What are chondrocytes?
    a) Cartilagenous tissue.
    b) Adipose tissue.
    c) Osteogenic tissues.
    d) Fibroblastic tissues.

23. What is the serum blood urea nitrogen test?
    a) The level of urea present in the blood.
    b) The level of nitrogen present in the blood.
    c) The level of waste (together urea + nitrogen) in the blood.
    d) The level of creatinine in the blood.

24. Which is the most abundant immunoglobulin in our body?
    a) IgM.
    b) IgE.
    c) IgA.
    d) IgG.

25. What are amniocytes?
    a) These are fetal cells of the immune complement system.
    b) These are fetal cells of the amniotic membrane.
    c) These are fetal cells of the amniotic fluid.
    d) These are fetal cells of the umbilical cord matrix.

26. Patients with chronic granulomatous disease are found to have which type of serious disease frequently?
    a) Pneumonia.
    b) Osteopenia.
    c) Chronic myeloid leukamia.
    d) mutliple myeloma.

27. Which hormone is thought to be primarily responsible for causing osteoporosis in women?
    a) Progesterone.
    b) Estradiol.
    c) Estrogen.
    d) Follicle stimualting hormone.

28. In pregnancy test kits, which hormone is present to detect a positive pregnancy?
    a) Human chorionic gonadotrophin hormone.
    b) Estrogen.
    c) Progesterone.
    d) Follicle stimualting hormone.

29. Mark the correct stem cell marker for pluripotent stem cells?
    a) Sca-1.
    b) Stro-1.
    c) Vimentin.
    d) Oct-3/4.

30. Which organelle is regarded as the powerhouse of the cell?
    a) Mitochindria.
    b) Ribosomes.
    c) Endoplasmic reticulum.
    d) Golgi apparatus.

31. Thrombopoiesis is also defined as?
    a) Formation of reticuloendothelial cells.
    b) Formation of erythrocytes.
    c) Formation of bone marrow cells.
    d) Formation of platelets.

32. Oct-3/4 and SOX2 is a marker for?
    a) Mesenchymal stem cells.
    b) Endothelial progenitor cells.
    c) Embryonic stem cells.
    d) Hematopoietic stem cells.

33. CD90 positive and CD34 negative characterizes which type of stem cells?
    a) Hematopoeitic stem cells.
    b) Induced pluripotent stem cells.
    c) Mesenchymal stem cells.
    d) Embryonic stem cells.

34. Amnion of the amniotic membrane contains a special type of stem cells. Mark the best answer?
    a) Embryonic stem cells.
    b) Induced pluripotent stem cells.
    c) Amnotic epithelial stem cells.
    d) Totipotent stem cells.

35. Hematopoeitic stem cell transplantation involves which type of stem cells?
    a) CD44+.
    b) CD34+.
    c) CD11b.
    d) CD38+.

36. Where is erythropoietin produced in the fetus?
    a) Kidney.
    b) Bone marrow.
    c) Lymph node.
    d) Liver.

37. What is plasmapheresis?
    a) Removes the leukocytes.
    b) Removes the erythrocytes.
    c) Seperates the plasma.
    d) Seperates the stem cells.

38. What is the difference between Th1 and Th2 profile?
    a) Th1 is cell mediated and Th2 is humoral mediated.
    b) Th1 is humoral mediated and Th2 is cell mediated.
    c) Th1 helps in immunosuppression whereas Th2 helps in homeostasis.
    d) Th1 helps in immunosuppression whereas Th2 helps in homeostasis.

39. Which is the primary hemoglobin that is present only during the embryonic life?
    a) Gower II.
    b) Gower I.
    c) Portland I.
    d) Portland II.

40. Northern Blotting is used to detect
    a) DNA.
    b) Protein.
    c) RNA.
    d) Virus.

41. Downs Syndrome is an anomaly where there is a trisomy of which chromosome number?
    a) Chromosome no.4.
    b) Chromosome no.9.
    c) Chromosome no.21.
    d) Chromosome no.22.

42. Where does embryonic hematopoiesis initially start?
    a) Yolk sac.
    b) Amniotic sac.
    c) Liver.
    d) Thymus.

43. Embryonic stem cells can be isolated from?
    a) Adipose fat tissue.
    b) Cord blood.
    c) Inner cell mass of the blastocyst stage.
    d) Whartons Jelly.

44. Western Blotting is a blotting technique used for detect?
    a) DNA.
    b) Different range of proteins based on their molecular weight.
    c) A specific protein only from a mixture of proteins.
    d) RNA.

45. Which is the most common nerve graft used for surgical repair of neural injuries?
    a) Sciatic nerves.
    b) Sural nerves.
    c) Ulnar nerves.
    d) Peroneal nerves.

46. Very Small embryonic stem cells are?
    a) Multipotent stem cells.
    b) Unipotent stem cells.
    c) Pluripotent stem cells.
    d) Totipotent stem cells.

47. What does VDRL stands for?
    a) Venereal disease research laboratory test.
    b) Venereal disease and laboratory test.
    c) Venereal disease research laboratory.
    d) Venereal disease and research laboratory.

48. Label the correct cryopreservant that is normally used to cryopreserve human stem cells?
    a) Dimethyl sulfoxide (DMSO).
    b) Dulbeccos modified eagles medium (DMEM).
    c) Fetal calf serum.
    d) Beta mercaptoethanol (BME).

49. What are the four cardinal signs of Parkinson Disease?
    a) Lethargy, rigidity, morbidity and mortality.
    b) Tremor, rigidity, polyphagia and morbidity.
    c) Tremor, rigidity, bradykinesia, and postural instability.
    d) Tremor, polyphagia, bradykinesia, postural instability.

50. Induced pluripotent stem cells are obtained from which type of cells?
    a) Mesenchymal stem cells.
    b) Pluripotent stem cells.
    c) Somatic or adult cells.
    d) Adult stem cells.

51. What is the genetic sequence of the human telomerase enzyme?
    a) TGTTAA sequence.
    b) ATTGGT sequence.
    c) TTAAAA sequence.
    d) TTAGGG sequence.

52. CD25+ CD4+ is a marker for which type of Th cell?
    a) Th1.
    b) Th2.
    c) Tfh.
    d) Treg.

53. What is mutiple myeloma?
    a) Tumour of the plasma cells.
    b) Tumour of the leukocytes.
    c) Tumour of the lymphocytes.
    d) Tumour of the hematopoietci stem cells.

54. What is asymmetric division of stem cells?
    a) Production of two daughter stem cells out of which one become a teratoma.
    b) Production of two stem cells out of which one undergoes apoptosis to maintain cell homestasis and the other remain stem cell.
    c) Production of two cells where one remains as a stem cell and the other develops into a progenitor and somatic cell specific to that tissue or organ.
    d) Production of two cells where one cell undegoes apoptosis to maintain the homeostasis and the other become an adult cell.

55. What happens if cryopreservation of stem cells is done rapidly?
    a) Intracellular ice formation.
    b) Dehydration.
    c) Spontaneous stem cell differentiation.
    d) Rapid cooling has no deleterious effect on stem cell cryopreservation, in fact it is favourable.

56. In a cord blood bank, which component of the blood is stored?
    a) Buffy coat.
    b) Plasma.
    c) Erythrocytes.
    d) Mono nuclear cells.

57. Human amnion part of the amniotic membrane contains a special type of stem cells. Label the correct option?
    a) Mesenchymal stem cells.
    b) Amniocytes.
    c) Very small embryonic stem cells.
    d) Epithelial stem cells.

58. Wharton's Jelly is rich in which type of stem cells?
    a) Very small embryonic stem cells.
    b) Hematopoietic stem cells.
    c) Embryonic stem cells.
    d) Mesenchymal stem cells.

59. Which is the natural pacemaker of the human heart?
    a) Left atrium.
    b) Right ventricle.
    c) Sinoatrial node.
    d) Left ventricle.

60. Which is the least abundant protein found in plasma?
    a) Fibrinogen.
    b) Albumin.
    c) Globulin.
    d) Creatinine.

61. What is the function of p21 gene?
    a) It helps in metastasis of cancer cells.
    b) It is a tumor suppressor gene that prevents abnormal cell cycle divison.
    c) It helps stem cells to undergo proliferation.
    d) It is related to the differentiation of stem cells.

62. Formation of teratomas in in vivo studies are hallmark properties of which type stem cells
    a) Mesenchymal stem cells.
    b) Hematopoietic stem cells.
    c) Neural stem cells.
    d) Pluripotent stem cells.

63. Mark the correct classification of minor MHC class I complex
    a) HLA-A, B, and C.
    b) HLA-E,F,and G.
    c) HLA-DP, DQ, DR.
    d) HLA-DM and DO.

64. Stem cells are defined as
    a) A cell that has the ability to divide only once and stay the same as other kinds of cells.
    b) A cell that has the ability to continuously divide and differentiate into various other kinds of cells/tissues.
    c) Any cell of a living organism other than the reproductive cells.
    d) A cell that contains a nucleus surrounded by a membrane and whose DNA is bound together by proteins.

65. First mouse Embryonic Stem Cells was produced in 1981 by the scientists
    a) Evans and Kaufman.
    b) Thomson and Campbell.
    c) Saito and Cibelli.
    d) Iwasaki and Notarianni.

66. Embryonic stem cells are derived from the _____ of the blastocyst.
    a) Mesoderm.
    b) Ectoderm.
    c) Blastocoel.
    d) Inner cell mass.

67. As per the potency of stem cells, the embryonic stem cells are _____
    a) Pluripotent.
    b) Totipotent.
    c) Unipotent.
    d) Oligopotent.

68. Embryonic stem cells can differentiate into which types of cell?
    a) Only cells that can produce artificial skin.
    b) All types of specialized cells in the body.
    c) Only cells that can produce insulin.
    d) Only brain stem cells and specialized brain cells.

69. In the treatment of burns, scientists can use stem cells to help them replace
    a) All parts of the patient's skin.
    b) Hair follicles and sweat glands.
    c) The outermost layer of the skin.
    d) All parts of the skin except sweat glands.

70. What are the roles of stem cells in our bodies?
    a) We are not sure what roles stem cells play in the body.
    b) They produce new specialized cells to replace cells that die or are used up.
    c) They fight against infections.
    d) They perform specialized roles in the body (e.g. produce insulin, transmit signals in the nervous system).

71. What is the least invasive source of adult stem cells from the human body?
    a) Cord blood.
    b) Adipose tissue.
    c) Bone marrow.
    d) Skin.

72. In iPS cells production, Shinya Yamanaka introduced of four specific genes convert somatic cells into pluripotent stem cells are following.
    a) Oct3/4, Sox2, Nanog and Klf4.
    b) Oct3/4, Sox2, cMyc and Lin28.
    c) Oct3/4, Sox2, cMyc and Klf4.
    d) Sox2, Lin 28, Nanog and Klf4.

73. Shinya Yamanaka was awarded the Nobel Prize along with Sir John Gurdon "for the discovery that mature cells can be reprogrammed to become pluripotent cells in the year
    a) 2008.
    b) 2010.
    c) 2012.
    d) 2014.

74. Cardiomyocyte cells can be generated which layer of embryonic stem cells and iPS cells
    a) Endoderm.
    b) Mesoderm.
    c) Ectoderm.
    d) Hypoderm.

75. In vitro produced blastocysts have the following type of cells
    a) Germ cells and somatic cells.
    b) Inner cell mass cells and endodermal cells.
    c) Inner cell mass and Trophectodermal cells.
    d) Ectoderm, Mesoderm and endodermal cells.

76. Amphotericin-B is effective against the following which is used during in vitro cell culture.
    a) Yeasts.
    b) Fungi.
    c) Both fungi and yeasts.
    d) Gram +ve and Gram –ve bacteria.

77. Adult stem cells stem cells are present
    a) Blastocyst only.
    b) Bone marrow only.
    c) Any tissue of the body only.
    d) Morula only.

78. What is the difference between embryonic stem cells and adult stem cells?
    a) Embryonic stem cells can differentiate into more cell types than adult stem cells.
    b) Adult stem cells are pluripotent, just like embryonic stem cells.
    c) Adult stem cells can differentiate into more cell types than embryonic stem cells.
    d) Adult stem cells grow bigger than embryonic stem cells.

79. The oogonia (primordial germ cells) proliferate extensively by mitotic divisions in fetal stage cells in human beings.
    a) Up to 1-2million.
    b) Up to 3-4million.
    c) Up to 4-5million.
    d) Up to 5-6million.

80. Hybridoma technology for monoclonal antibody production was developed by
    a) Kohler and Milstein.
    b) Khorana and Nirenberg.
    c) Khorana and Korenberg.
    d) Beedle and Tautum.

81. Insulin are generally produced from the cells
    a) Pancreatic Alpha cells (α-cells).
    b) Pancreatic Beta cells (β-cells).
    c) Pancreatic Gamma cells (γ-cells).
    d) Pancreatic Delta cells (δ-cells).

82. The development of the CRISPR technique and got Nobel Prized in 2020 are the scientists
    a) David Baltimore and Paul Berg.
    b) Charles M. Rice and Andrea Ghez.
    c) Roger Penrose and Reinhard Genzel.
    d) Jennifer Doudna and Emmanuelle Charpentier.

83. The genome size of the novel coronavirus causing the pandemic throughout the world varies from
    a) 9.8 kb to 9.9 kb.
    b) 19.8 kb to 19.9 k.
    c) 29.8 kb to 29.9 kb.
    d) 39.8 kb to 39.9 kb.

84. Stages of embryogenesis are present here but one is incorrect
    a) Fertilization.
    b) Cleavage.
    c) Morula.
    d) Bostulation.

85. Embryonic stem cells are generally called
    a) Pluripotent cells.
    b) Differentiated cells.
    c) Immunogenic cells.
    d) Heterogenic cells.

86. _____ is the technique used to detect genetic disorders.
    a) Preimplantation genetic diagnosis (PGD).
    b) Gene therapy.
    c) Cell therapy.
    d) Proliferation.

87. Population doubling time is determined at the following phase
    a) Lag phase.
    b) Log phase.
    c) Stationary phase.
    d) Plateau phase.

88. The percentage of CO2 invitro stem cell culture system for better production is generally used
    a) 1% CO_2.
    b) 3% CO_2.
    c) 5% CO_2.
    d) 7% CO_2.

89. Induced pluripotent stem (iPS) cells can be generated directly from
    a) Adult somatic cells.
    b) Cancer cells.
    c) Endometrial cells.
    d) Epithelial cells.

90. Which of the stem cell source of "ethical" adult stem cell collected non-invasive way?
    a) Adipose cells.
    b) Bone marrow cells.
    c) Cord blood cells.
    d) Peripheral blood cells.

91. Which type of stem cell can differentiate into some related types of cells, but not all types of cells?
    a) Multipotent.
    b) Totipotent.
    c) Omnipotent.
    d) Pluripotent.

92. Multipotent stem cells are generally defined
    a) Stem cells that can only differentiate into one cell type found in a specific tissue.
    b) Stem cells that can give rise into any other cell type found in the body.
    c) Stem cells that can differentiate into each of the three germ layers.
    d) Stem cells that can only give rise to a limited range of cells within a specific cellular line.

93. Where are most adult stem cells found in the human body?
    a) In the nervous system.
    b) In the skin.
    c) In the bone marrow.
    d) In the blood.

94. Induced pluripotent stem (iPS) cells were first generated from mouse embryonic fibroblasts by the retrovirus-mediated transfection using the genes now called Yamanaka factor
    a) Oct3/4, Sox2, Nanog, and Lin28.
    b) Oct3/4, Nanog, c-Myc, and Lin28.
    c) Oct3/4, Lin28, c-Myc, and Klf4.
    d) Oct3/4, Sox2, c-Myc, and Klf4.

95. Stem Cell Therapy provides pain relief of the human beings that is
    a) Temporary repair of the tissue.
    b) Permanent repair of the tissue.
    c) Facilitate repair of the tissue.
    d) Cause cancer of the tissue.

96. Leukemia Inhibitory Factor (LIF) prevents the following in mouse embryonic stem cells in in vitro culture condition.
    a) Differentiation of cells.
    b) Self renewal of cells.
    c) Proliferation of cells.
    d) Dedifferentiation of cells.

97. Blood cells are generated from the stem cells
    a) Mesodermal cells.
    b) Ectodermal cells.
    c) Endodermal cells.
    d) Hematopoietic cells.

98. What is the chromosome number of laboratory mouse, human and Rice?
    a) 40, 46 and 24.
    b) 40, 46 and 22.
    c) 40, 44 and 24.
    d) 42, 46 and 26.

99. Which of the following are not myeloid cells?
    a) Macrophages.
    b) Monocytes.
    c) Neutrophils.
    d) T cells.

100. Hematopoietic stem cells, like all adult stem cells, mostly exist in a state of _____ or reversible growth arrest.
    a) Opalescence.
    b) Coalescence.
    c) Senescence.
    d) Quiescence.